35. $f(x) = x^3 + ax^2 + bx$

solve for a & b so that f(x) has a min at $x = 3$ and a max at $x = -1$

$f'(x) = 3x^2 + 2ax + b$

$f'(-1) = 3(-1)^2 + 2a(-1) + b$

Solve for B

$0 = 3 - 2a + b$

$b = 2a - 3$

$f'(3) = 3(3)^2 + 2a(3) + b$

Plug in B

$0 = 27 + 6a + (2a - 3)$

$0 = 8a + 24$

$8a = -24$

$\boxed{a = -3}$

Solve for b

$b = 2a - 3$

$b = 2(-3) - 3$

$\boxed{b = -9}$

if f(x) has a min at $x = 3$ and a max at $x = -1$,

$\boxed{f(x) = x^3 - 3x^2 - 9x}$

b) to find inflection points, we use the second derivative test.

$f'(x) = 3x^2 + 2ax + b$

$f''(x) = 6x + 2a$

1

$0 = 6(\cancel{4}) + 2a$

$2a = -6$

$\boxed{a = -3}$

$0 = 3(4)^2 + 2(-3)(4) + b$

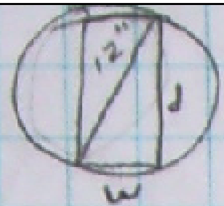
$0 = 48 - 24 + b$

$\boxed{b = -24}$

if f(x) has a min at x=4 and an inflection pt. at x=-1,

$\boxed{f(x) = x^3 - 3x^2 - 24x}$

37. a)




$S = wd^2$

$144 = w^2 + d^2$

$d^2 = 144 - w^2$

$144 = (\sqrt{48})^2 + d^2$

$144 = 48 + d^2$

$d^2 = 96$

$\boxed{d = \sqrt{96} \quad d = 9.79}$

$S = w(144 - w^2)$

$S = 144w - w^3$

$S' = 144 - 3w^2$

$S = \sqrt{48} \cdot (\sqrt{96})^2$

$S = \sqrt{48} \cdot 96$

$\boxed{S = 665.11}$

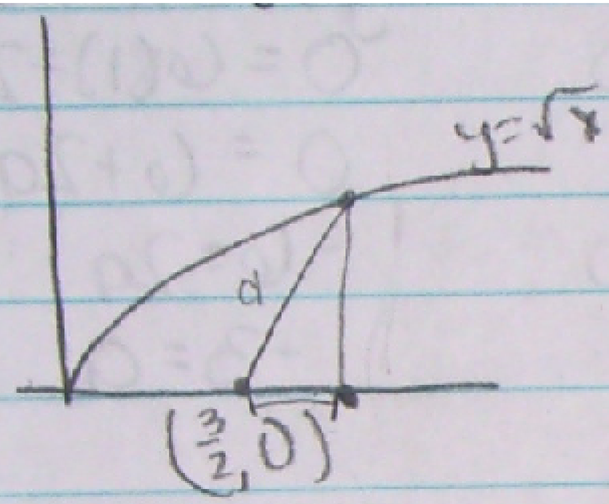
$0 = 144 - 3w^2$

$3w^2 = 144$

$w^2 = 48$

$\boxed{w = \sqrt{48} \quad w = 6.93}$

41




$d^2 = (x - \frac{3}{2})^2 + x$

$d = \sqrt{(x - \frac{3}{2})^2 + x}$

$d' = (2(x - \frac{3}{2}))(1) + 1$

$= 2x - 3 + 1$

$0 = 2x - 2$

$2 = 2x$

$1 = x$

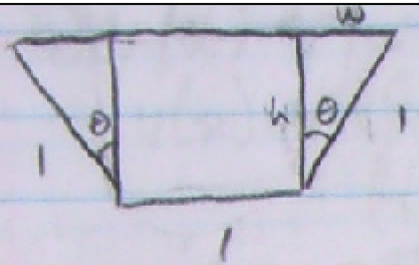
$d = \sqrt{(1 - \frac{3}{2})^2 + 1}$

$= \sqrt{-\frac{1}{2}^2 + 1}$

$= \sqrt{1.25}$

$\approx 1.12 = \frac{\sqrt{5}}{2}$

47.




$\cos\theta = \frac{h}{1}$ $\quad$ $\sin\theta = \frac{w}{1}$

$\cos\theta = h$ $\quad$ $\sin\theta = w$

$$A = \cos\theta\sin\theta + \cos\theta$$

$$A' = \cos\theta\cos\theta + \sin\theta \cdot -\sin\theta - \sin\theta$$

$$= \cos^2\theta - \sin^2\theta - \sin\theta$$

$$= 1 - \sin^2\theta - \sin^2\theta - \sin\theta$$

$$0 = -2\sin^2\theta - \sin\theta + 1$$

$$\theta = \frac{1 \pm \sqrt{1+8}}{-4}$$

$$\theta = \frac{1 \pm 3}{-4}$$

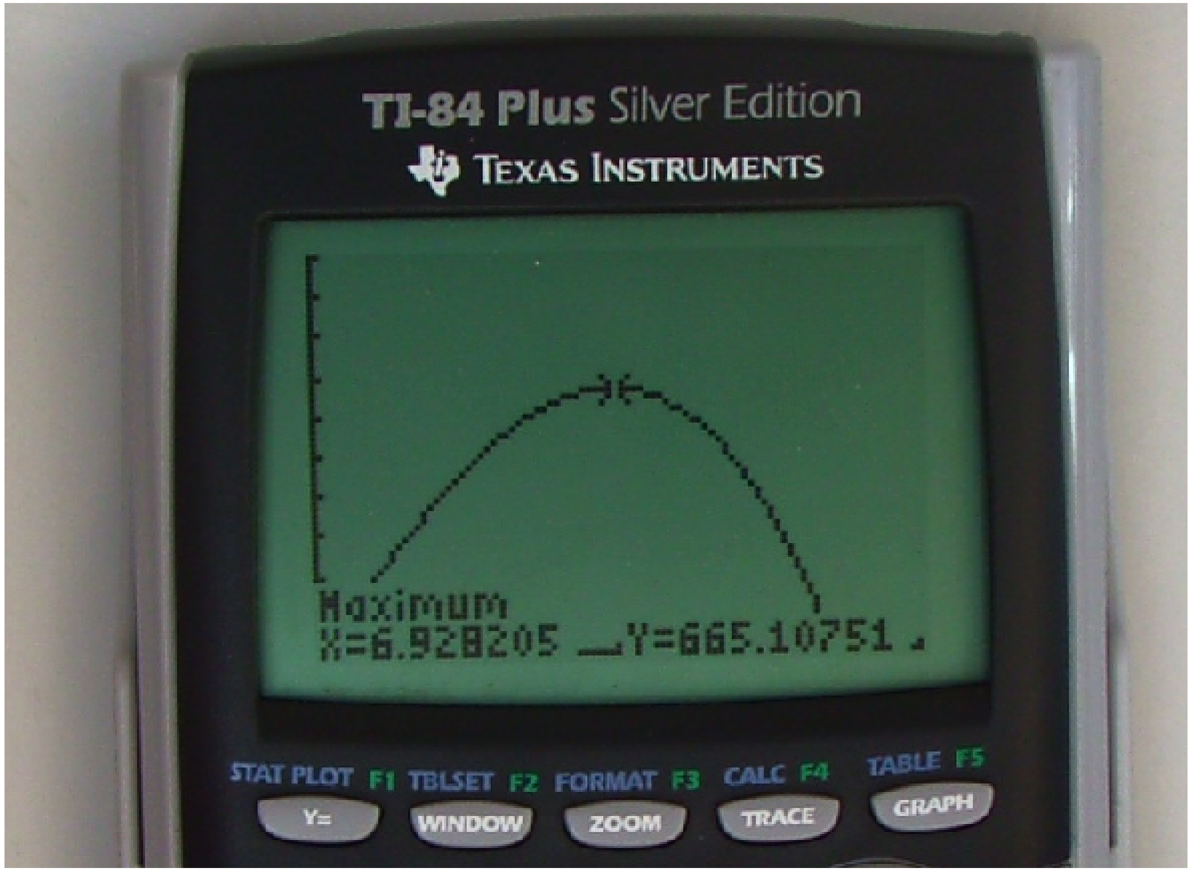
$$\theta = -1, \frac{1}{2}$$

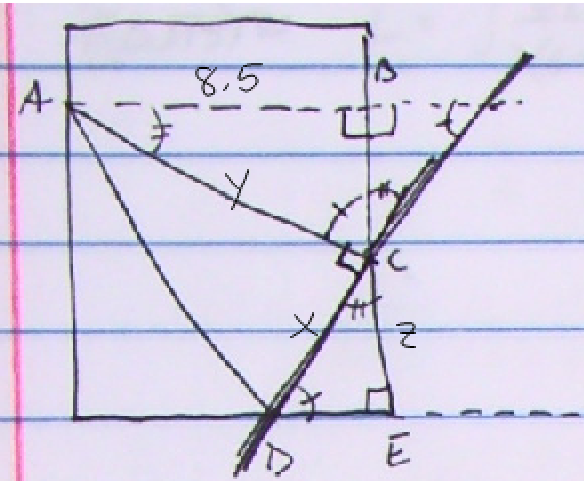
$$\sin\theta = -1, \frac{1}{2}$$

$$\cancel{\sin^{-1}(-1) = -\frac{\pi}{2}}$$

$$\sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$$

$$\theta = \frac{\pi}{6} = 30^\circ$$


TI-84 Plus Silver Edition
TEXAS INSTRUMENTS
Maximum
X=6.928205 Y=665.10751
STAT PLOT F1 TBLSET F2 FORMAT F3 CALC F4 TABLE F5
Y= WINDOW ZOOM TRACE GRAPH




$\Delta ABC \sim \Delta CED$ so sides proportional

$$\frac{y}{8.5} = \frac{x}{z}$$

$$\frac{y}{8.5} = \frac{x}{\sqrt{8.5(2x-8.5)}}$$

$$\frac{y^2}{8.5^2} = \frac{x^2}{8.5(2x-8.5)}$$

$$y^2 = \frac{x^2 \cdot 8.5}{(2x-8.5)}$$

$$L^2 = x^2 + \frac{x^2 \cdot 8.5}{2x-8.5} \rightarrow L^2 = \frac{2x^3 \cancel{- 8.5x^2 + 8.5x^2}}{2x-8.5}$$

$$\boxed{L^2 = \frac{2x^3}{2x-8.5}}$$

b.) $L^2 = \dfrac{2x^3}{(2x-8.5)}$

$$L' = \frac{(2x-8.5)(6x^2) - (2x^3)(2)}{(2x-8.5)^2}$$

$$= \frac{12x^3 - 51x^2 - 4x^3}{(2x-8.5)^2}$$

$0 = 8x - 51$

$\frac{51}{8} = \frac{8x}{8}$

$$= \frac{8x^3 - 51x^2}{(2x-8.5)^2}$$

$0 = 2x - 8.5$

$\frac{8.5}{2} = \frac{2x}{2}$

$\boxed{x=0}$ $\boxed{x=6.375}$ $\boxed{4.25=x}$

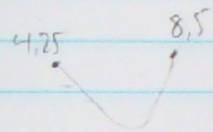
$$0 = \frac{x^2(8x-51)}{(2x-8.5)^2}$$

$-$ $-$ $-$ $+$

0 4.25 6.375

$\boxed{6.375 = \text{min}}$

c.) ~~8.5 = max~~




$f(6.375) = 11.042$

$r^2 + h^2 = 16 \Rightarrow r^2 = 16 - h^2$

$\frac{1}{3}\pi r^2 \cdot h$

$\frac{1}{3}\pi(16 - h^2) \cdot h \Rightarrow (\frac{16}{3}\pi - \frac{1}{3}\pi h^2) \cdot h \Rightarrow \frac{16}{3}\pi h - \frac{1}{3}\pi h^3$

$f(x) = \frac{16}{3}\pi h - \frac{1}{3}\pi h^3$

$f'(x) = \frac{16}{3}\pi - \pi h^2$

$f'(x) = \pi(\frac{16}{3} - h^2)$

$f'(x) = 0$ at $h = \pm\sqrt{16/3}$

Volume is maximized when $\boxed{h = \sqrt{16/3}}$ (can't have a negative length)

$r^2 = 16 - \sqrt{16/3}^2 \Rightarrow 16 - 16/3 \Rightarrow 32/3$, $\boxed{r = \sqrt{32/3}}$

Circumpherence $= 2\pi r$

Original Circle $= 2\pi(4) = 8\pi$

Cone $= 2\pi(\sqrt{32/3})$

$x = 8\pi - 2\pi(\sqrt{32/3}) = \boxed{4.61193 \text{ inches} = x}$